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ABSTRACT

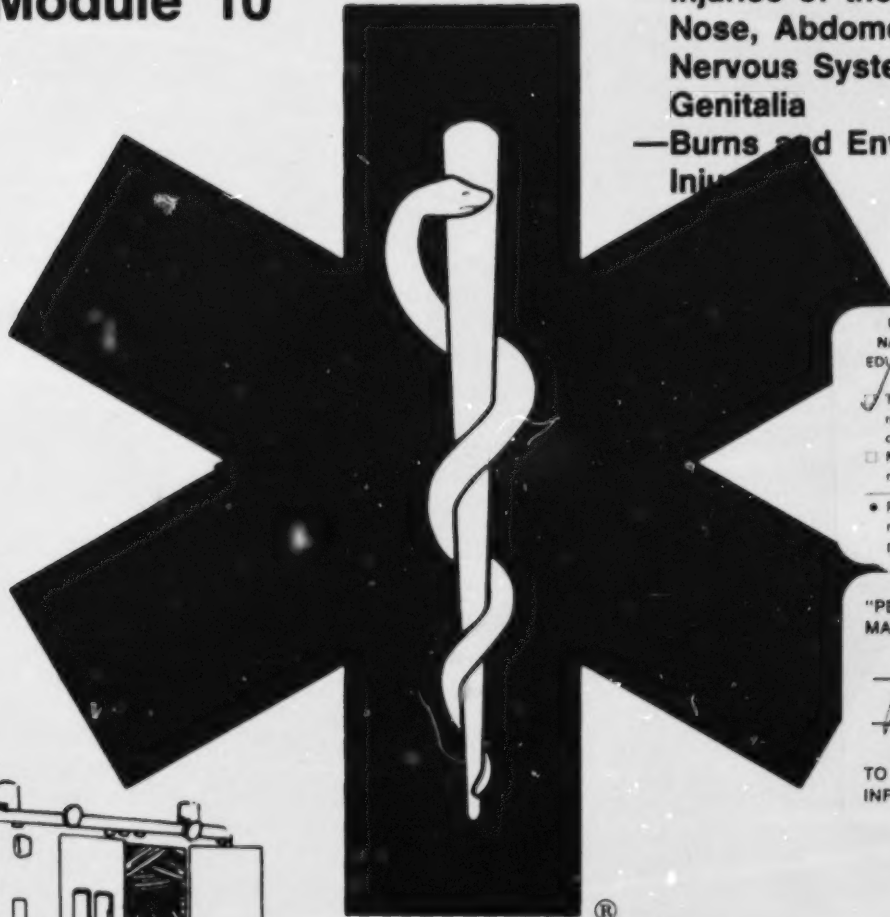
This training manual for emergency medical technicians, one of 14 modules that comprise the Emergency Victim Care textbook, covers injuries of the eyes, ears, nose, abdomen, central nervous system (CNS), and genitalia; burns; and environmental injuries. Objectives stated for the two chapters are for the student to be able to describe procedures for emergency treatment for injuries of the eyes, ears, nose, CNS, chest, abdomen, and genitalia and to describe signs, symptoms, and emergency care for burns, cold injuries, hypothermia, and emergencies due to heat. Informative material is provided on eye injuries, ear injuries, nose injuries, CNS injuries, head injuries, chest injuries, abdominal injuries, genitalia injuries, burns, cold injuries, abnormal lowering of body temperature, heat cramps and exhaustion, and heatstroke. (YLB)

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EMERGENCY VICTIM CARE

Module 10

- Injuries of the Eye, Ear, Nose, Abdomen, Central Nervous System and Genitalia
- Burns and Environmental Injuries



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This text is intended for use as a learning aid and to excite your curiosity and eagerness to serve patients. This text is not exhaustive and the opinions and directory comments will change from time to time as new procedures and laws become effective.

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EMERGENCY VICTIM CARE

A TRAINING MANUAL FOR EMERGENCY MEDICAL TECHNICIANS

OHIO TRADE AND INDUSTRIAL EDUCATION SERVICE

**DIVISION OF VOCATIONAL EDUCATION
STATE DEPARTMENT OF EDUCATION
COLUMBUS, OHIO**

TO THE LEARNER

The 1983 Emergency Victim Care textbook revision has been grouped into 14 modules. The modules have been grouped by content matter as follows:

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Preface
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Acknowledgment
Student-Instructor Relationship

Personnel
Emergency Medical Service Vehicles
EMS Communication
Records and Reports

Module 2

Equipment
Safe Driving Practices
Legal Aspects
Controlling the Situation
Action Evaluation Conference

Module 3

Anatomy & Physiology

Module 4

Vital Signs
Patient Assessment

Module 5

Cardiopulmonary Resuscitation (CPR)

Module 6

Bleeding Control
Wounds and Bandaging
Shock

Module 7

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Module 8

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Drug-Related Problems

Module 9

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Dislocations

Module 10

Injuries of the Eye, Ear, Nose, Abdomen,
C.N.S. and Genitalia
Burns and Environmental Injuries

Module 11

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Module 13

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INJURIES OF THE EYE, EAR, NOSE, CENTRAL NERVOUS SYSTEM, CHEST, ABDOMEN AND GENITALIA

OBJECTIVES

Upon completion of the following chapter, you will be able to:

- describe procedures for emergency treatment for specified injuries, including:
 - eye injuries
 - ear injuries
 - nose injuries
 - central nervous system injuries
 - chest injuries
 - abdominal injuries
 - genitalia injuries

Following instruction and/or practice, you will be able to:

- administer emergency treatment for specified injuries.

INTRODUCTION

Due to today's fast-moving world of modern mechanical devices, activities, increased population and leisure time, the number of accidental injuries has greatly increased. Many of the injuries occur to organs of the body that control the basic senses of sight, sound and smell. Other organs which may receive injury may be related either directly or indirectly to some vital function of our body such as digestion, respiration, circulation, etc. Therefore, it is extremely important that every emergency medical technician be fully aware of the responsibility to know how to care for and prevent further injury to these important body organs.

Eye injuries are more serious than similar injuries to other tissues because of the ever present danger of vision loss. A minor injury improperly cared for can progress into one that may be serious, and a penetrating eye wound may result in blindness.

The most frequently occurring eye injuries result from foreign bodies lodging or embedding in the eye tissues. Under certain emergency conditions, however, injuries may range from trauma to the eyelids, hemorrhage into the cavity of the eye, laceration of the eyeball, to the possibility of removal of the entire globe.

Without special training, interference may lead to disaster. Emergency care should be conservative and directed toward bringing the victim into the hands of a specialist at the earliest time and in the best physical condition.

EXAMINATION

No **time-consuming** examination should be made to determine the extent of injury. A simple, visual examination should be sufficient to alert the EMT. This simple examination should be accomplished without exerting any pressure on the eyeball. Remember, even the slightest pressure may cause the loss of part or all of the vital fluids in the eye.

A penetrating wound should always be suspected until it has been ruled out by a physician. Some obvious signs of penetrating wounds are: (1) visible defects or damage of the eyeball, (2) visible foreign bodies or protruding objects, and (3) loss of the eye fluids (vitreous humor, aqueous humor).

EMERGENCY CARE— FOREIGN OBJECTS

Sometimes a foreign body under the upper lid may be removed by drawing the upper lid down over the lower lid; as the upper lid returns to its normal position, its under surface will be drawn over the lashes of the lower lid and the foreign body may be removed by the wiping action.

Another method is to expose the under surface of the upper lid by grasping the eyelashes between the thumb and forefinger of one hand and turning the lid up over the end of a match stick or applicator stick; the particle may then be removed carefully with a corner of a piece of folded sterile gauze. See Figure 1.

Should a foreign object **become lodged** on the eyeball, do not attempt to disturb it; it may be forced into the eye and cause a serious condition. Place a metal eye shield over the eye (Figures 2 and 3) and transport.

EMERGENCY CARE— PENETRATING OBJECTS

Penetrating wounds of the eye include any injury that may cut or penetrate the eyeball. The following procedures must be observed.

1. If there is an object penetrating the eyeball, do not remove it.



Figure 1. Technique of rolling the eyelid. A—Depress the upper lid with an applicator stick and grasp lash between thumb and index finger; B—Roll the lid by lifting it up over the applicator stick.

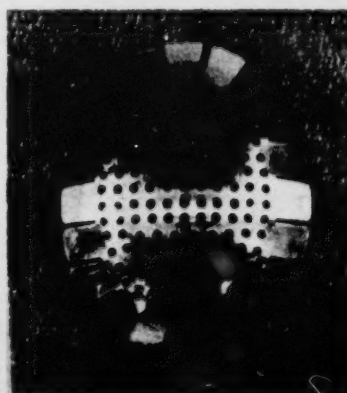


Figure 2. A metal eye shield used to protect an injured eyeball. The outer edges must be taped to prevent damage to soft tissue around the eye.

2. If the object is protruding from the eye, bandages should be used carefully to support the object.

3. If there is no object protruding or if the embedded object is not extending beyond the eye, cover the eye with a metal eye shield (Figure 3). Do not put compresses or other gauze dressings on the injured eye; they may cause harmful pressures.

4. Cover the uninjured eye. This will immobilize and keep the eyes at rest.

5. **Keep the victim** backside down (supine position). This will help to keep the vital structures inside the injured eye.

6. Reassure the victim; explain what you are doing and why you are closing both eyes.

EMERGENCY CARE—BLOWS TO THE EYE AND SURROUNDING TISSUE

Injuries resulting from blows to the eye and eye area causing the common "black eye" can be very serious. If there is any evidence of internal bleeding, change in vision, or damage to the iris, lens, or retina, special care is indicated and the victim must be transported to the proper medical facility. Any injury so severe as to cause internal bleeding may progress to a condition referred to as secondary hemorrhage and can cause glaucoma.

Place a metal eye shield over the injured eye; cover the uninjured eye to help immobilize the injured eye and transport.

EMERGENCY CARE—BURNS

Acid Burns—As a rule acid burns are instantaneous. The extent of the burn depends upon the strength of the acid and the duration of exposure to the eye tissue. Immediate treatment of acid burns requires flushing and washing the eye with large amounts of water. Sterile water is preferred, but the washing can be carried out with ordinary tap water. Speed is of great importance. The eyes should be flushed for at least 15 to 30 minutes depending upon the quantity of acid; special attention must be paid to flushing under both eyelids. This flushing procedure can be carried out during trans-



Figure 3. The proper application of a metal eye shield, with tape covering the outer edges.

portation so as not to cause any unnecessary delay in bringing the victim the proper medical care as soon as possible.

Alkali Burns—Unlike acid burns, alkali has a tendency to "burrow" into the eye tissue. Immediate flushing with large amounts of water is the best emergency treatment. Flushing must continue for 30 to 45 minutes, and every bit of alkali must be removed. Attention must be given to the eyelids; lift them and flush. See Figure 4.



Figure 4. Technique of flushing the eyes. Be sure eyes are held open while being flushed.

Thermal Burns—Because of the normal blink reflex, thermal burns of the eye are usually limited to the eyelids. Minor burns are best treated by first closing the lids and then applying a loose, soft dressing.

If the burns are severe, in all likelihood there will also be severe burns about the face and body. Shock may complicate the situation and, therefore, should be treated first. After starting the treatment, the eyes must be flushed to remove any imbedded foreign material.

Molten metals, metallic sparks, cinders, etc., can cause severe burns requiring professional care as soon as possible.

Since dressings tend to increase the possibility of infection and prevent draining of secretions, the eyes should be left open.

Flash Burns—Exposure to ultraviolet rays may burn the cornea. These are "flash burns" and often happen to those looking at carbon arcs and welders' arcs without protective glasses. Burns of this type may also be caused from long exposure to the brilliant light of sun covered snow fields and open water. The first symptoms are scratchiness and flowing tears followed by painful sensitivity to light. Bandage both eyes loosely and transport. Ice packs or cold compresses may provide some comfort to the victim.

REMOVAL OF CONTACT LENSES

Contact lenses are designed to be worn while awake. If a person is injured or incapacitated, the lenses should be removed.

If professional help is not available and lenses must be removed:

- a. Determine the size of lens.
 - 1) Small corneal lenses are most widely used. The diameter is less than the colored part of the eye (iris).
 - 2) Larger scleral lenses cover the entire iris and some of the sclera.
- b. If the iris of the eye is not visible upon opening the eyelids, wait for an optometrist or ophthalmologist.
- c. If you are familiar with removing contact lenses and the patient is unable to assist, the safest method is to use a rubber lens suction cup.

There are two types of contact lenses:

- a. Hard lenses—stored wet.
- b. Soft lenses—stored wet in normal saline solution.

Precautions to be observed:

- a. Never use force in removing a lens.
- b. Do not store hard lenses near heat.
- c. Do not rinse in hot water.
- d. If lens is accidentally dropped, put a drop of wetting solution or water on clean fin-

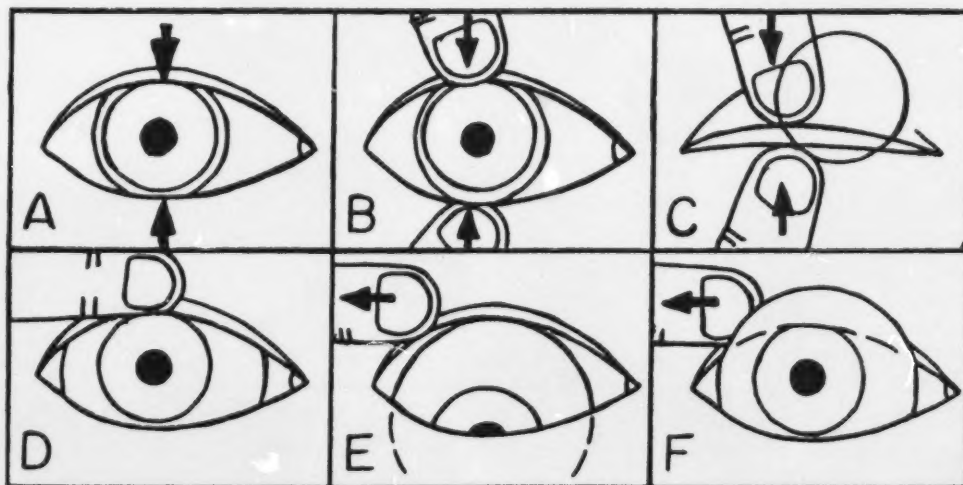


Figure 5

gertip and lightly touch finger to lens.
Never slide a lens along a surface or use
sharp object to pick it up. If lens adheres
to floor, pour water over it and float it
onto a piece of paper.

PROCEDURE

1. Preparation

- a. Place patient in recumbent position.

2. Method of removal. See Figure 5.

a. Corneal lens

- 1) Lightly place left index fingertip on upper eyelid margin (where the eye's lashes originate); place right index fingertip on lower eyelid margin close to the edge (A).
- 2) Gently pull lids apart and observe position of lens (B).
- 3) Open the lids wider beyond the edge of the lens and maintain this position.
- 4) With light, but firm, pressure against the eye, push the two eyelids together. This should cause lens to tip up on one edge.
- 5) The lens should slide out between the lids where it can be removed. (C).

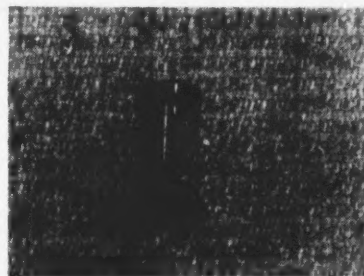


Figure 6. The "suction cup" type contact lens remover

OR

- 1) Remove lens by utilizing a suction cup or the rubber end of a medicine dropper. See Figure 6.
 - 2) Squeeze the suction cup, set it flat against the surface of the lens, release the squeezing action slightly, then lift the lens from the eye surface.
- #### b. Scleral lens
- 1) Place index finger parallel with and at edge of upper eyelid margin (D). Pull up on upper lid, then carefully press the lid downward and backward until the edge of the lens becomes visible (E).

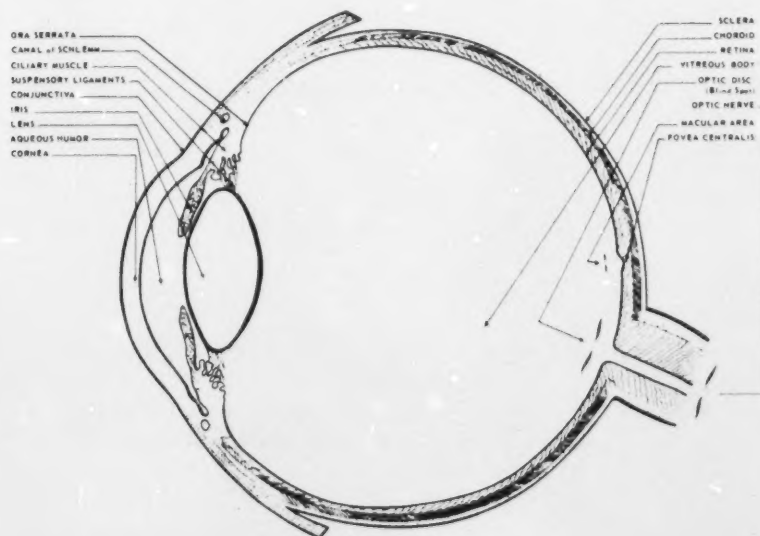


Figure 7. The above diagrams shows a cross section of the human eye and its many parts

- 2) Maintain pressure and slide finger toward the ear, pulling eyelid taut. This causes the lid to slide under the lens lifting the edge (F).
- 3) Grasp lens and remove.

c. Soft lens

- 1) Hold upper and lower eyelids apart with forefinger and thumb of one hand; instruct patient to look up; approximate thumb and forefinger of opposite hand to lens; grasp soft lens with a gentle pinching motion as you pull it down off the cornea. Squeeze edges of lens toward lens center carefully to break surface tension.

OR

- 2) Instruct patient to look straight ahead.
- 3) Hold top and bottom eyelids apart using two forefingers.
- 4) Approximating the two forefingers of each hand (like hard lens removal), grasp the soft lens by using a pinching movement, gently squeezing edges toward center with eyelid margins.

Removal should not be attempted if there is a question of an injury of the eye since the manipulation can aggravate the condition. The presence of contact lenses should be reported to the hospital emergency department.

EAR INJURIES

Injuries to the external ear (auricle) generally take the form of bruises, abrasions, and lacerations and are usually caused by glancing or direct blows. Injuries to the middle and inner ear are frequently caused by explosions or fractures of the base of the skull.

SIGNS AND SYMPTOMS

Injuries of the external ear require treatment to prevent infection and to control bleeding.

Injuries caused by explosions or external pressures will exhibit severe pain, bleeding and/or a discharge of fluids, and vertigo (a dizzy feeling with a loss of balance).

EMERGENCY CARE

Lacerations and abrasions of the external ear should be treated by applying sterile pressure

dressings. If the ear is severely mutilated, it will be best to apply a thick, soft dressing between the ear and the skull as well as on the ear, bandaged snugly; then, transport the victim.

If the external canal leading to the inner ear is torn or otherwise injured, the area should be cautiously and lightly packed with a sterile dressing and the victim transported.

Injuries to the inner ear caused by explosions or blasts are usually extremely painful and bleed freely. No attempt should be made to clean out the ear canal, dislodge clots, or pack the canal. Apply a very loose dressing to collect the flow but not to control it.

NOSE INJURIES

Injuries to the nose are generally caused by blows, kicks, falls or crushing, and can result in nosebleeds, excessive swelling, and fractures.

SIGNS AND SYMPTOMS

Nosebleed is usually obvious and will range from moderate to severe depending upon the

type and location of injury. Symptoms of fractures will include bleeding plus pain, swelling, and usually some deformity.

EMERGENCY CARE

In the care of nosebleeds that result from blows or falls, the EMT should check the es-

caping blood carefully to be sure a clear fluid (cerebrospinal fluid) is not mixed with the blood. If such fluid is present, the EMT should suspect a brain injury and the victim should be placed in a prone position or on side to permit drainage. No attempt should be made to stop the flow of blood.

Nosebleeds (epistaxis) occurring spontaneously will generally stop when a clot forms against the bleeding point. To assist the for-

mation of a clot, the EMT can apply a steady compression of the nostrils between the thumb and forefinger for four or five minutes. Cold produces a constriction of the blood vessels in the tissues at the bleeding site; therefore, the application of a cold, wet cloth to the nose, face, and neck is often very effective. The victim should be placed in a sitting position with the head tilted **slightly** backward.

CENTRAL NERVOUS SYSTEM INJURIES

BRAIN INJURIES

The brain and spinal cord are surrounded by a clear membrane called the dura mater. Classification of bleeding into the cranial cavity is determined by whether the bleed is above or below the dura.

When the brain is injured it reacts by swelling, as any other mass of tissue. However, there is little room for the brain to swell within the skull. The vital centers controlling respiration and other life processes may become impaired by the swelling of the surrounding tissues.

Following are some types of brain injuries the EMT may encounter.

CONCUSSION

A concussion is a temporary disturbance of cerebral function following a violent shock or jarring of the brain caused by a blow to the head.

Signs and Symptoms—Brief loss of consciousness; temporary dizziness; headache, nausea and/or vomiting; occasional disturbances in vision or eye movement.

CEREBRAL CONTUSION

A cerebral contusion is a bruising of the brain tissue following a blow to the head. There is more disturbance in cerebral function than with a concussion. This results in a swelling of the brain and compounds the problem.

Signs and Symptoms—May be progressive and are often related to the area of the brain initially involved. Changes in level of consciousness, sometimes prolonged; irritability; disorientation; vomiting; possible seizures; changes in vital signs, often decreased pulse and respirations, increased blood pressure.

SUBDURAL HEMATOMA

A subdural hematoma is a collection of blood below the dura at the surface of the brain. See Figure 8. Head trauma is most usually the underlying cause of this condition. Compression of the brain by the slowly expanding clot will cause symptoms within a few hours to a few days. Symptoms include headache, irritability, vomiting, changes in level of consciousness, unequal pupils, differences in movement or re-

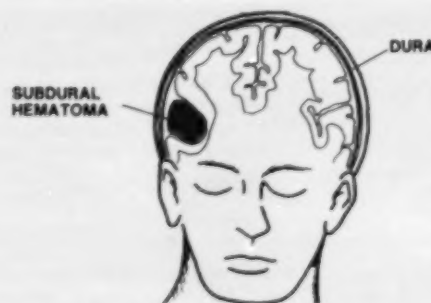


Figure 8. Subdural hematoma

sponse between the right and left sides of the body. Symptoms may initially resemble cerebral contusion.

EPIDURAL HEMATOMA

An epidural hematoma is a collection of blood above the dura. See Figure 9. Head trauma, particularly with a fracture of the skull, par-

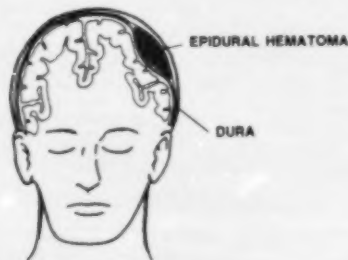


Figure 9. Epidural hematoma

ticularly over the temporal area where there is an extensive blood supply, is the usual cause. Following the injury the patient loses consciousness briefly. Consciousness is sometimes regained and the victim has minimal symptoms for a brief period. A short time later the victim becomes unconscious as the clot expands. In young children the blood loss **may** be significant enough to produce shock. The pupil on the affected side becomes dilated and non-reactive. Responses to painful stimuli may be notably abnormal and vary from right to left. Rapid surgical intervention is necessary.

PENETRATING INJURIES

Symptoms of a penetrating injury will depend on the area of involvement, extent of injury and object of penetration.

DO NOT remove the object, no matter how large.

EMERGENCY CARE OF HEAD INJURIES

1. To treat head injuries, the EMT must create and maintain an airway. This means proper positioning as well as keeping the airway cleared of any foreign material. An obstructed airway, no matter how slight, leads to a decrease in the circulating oxygen content and a buildup of carbon dioxide which may cause swelling of the brain tissue.

2. Vital signs and neurological evaluations should be conducted at intervals determined by the victim's condition and suspected injury. An accurate record should be kept, particularly if there is any progression of symptoms. Future evaluation and care may well depend upon the initial findings.

3. Evaluation by history and examination should be done to determine the possibility of a head injury and its extent. Not all victims with head injuries will show signs of external damage such as cuts, bruises or swelling. In fact, the most critical injuries often show no evidence of external trauma. Any victim involved in an

accident of force, especially if even a brief loss of consciousness is reported, should be treated for head and neck injuries. Symptoms may not always be readily apparent.

4. Immobilize the neck.

5. Administer oxygen as needed.

6. Elevate the victim's head 20°-30°. This will facilitate return of venous blood from the head and lessen the extent of swelling of the brain tissue.

7. Examine the victim for other signs of injury. Trauma to other areas of the body must not be overlooked. They may be more immediately life-threatening than the head injury.

8. Treat for shock as necessary.

9. Bandage head wounds as necessary, but **never** apply a pressure dressing. Because the scalp has a rich blood supply, there may seem to be a large amount of bleeding. Until injury to the underlying bone has been ruled out,

though, any pressure over the area may only serve to compound the injury. If there is any drainage from the nose or ears, a light sterile dressing may be loosely applied but no attempt should be made to stop the drainage.

10. Provide protection and safety for the victim. Those who are restless or disoriented may present a hazard to themselves and occasionally those nearby. Be firm yet gentle.

11. Provide emotional support for the victim and any family members as necessary.

12. Transport to a medical facility as soon as possible. The sooner evaluation and care is begun, the better the chances for recovery and limitation of complications.

CHEST INJURIES

Injuries of the chest may occur in many ways and combinations, and may involve the chest wall, ribs, pleura (lung sac), lungs, trachea, bronchi, esophagus, diaphragm, heart, and the major blood vessels.

Because of the involvement of the respiratory organs and breathing mechanism, many victims with chest injuries may die unless well-trained personnel take quick, positive action in the administration of emergency care.

Injuries to the chest may be either **penetrating** or **non-penetrating**. Open wounds are caused by a penetration of the chest wall by a knife, bullet, or other cutting object. Closed or crushing chest injuries are caused by vehicular accidents of all types, such as being thrown against the steering wheel or having some blunt object strike the chest with force. Injuries of this type range from a bruise to a severe stove-in or flail chest to fractures of the breastbone with contusions of the heart. Contusions of the heart may result in a very serious condition known as "cardiac tamponade," due to bleeding into the heart sac. This prevents the heart from functioning properly and can only be treated in the hospital.

PNEUMOTHORAX

In injuries of the chest involving the lungs, air escapes into the lung cavity or pleural space. See Figure 10. The condition of air in the pleural space around the lung is called **pneumothorax**. See Figure 11. Penetrating wounds may pierce the pleura and allow air to enter

the pleural space from the outside; or the sharp ends of a fractured rib may penetrate both layers of the pleura and the lung so air may enter the pleural space from the lung. When air enters the pleural space it destroys the vacuum normally present. As a result, the lung on the injured side cannot expand but instead is collapsed. A pneumothorax of considerable size can usually be suspected by decreased rib movement on the affected side.

SUCKING CHEST WOUND

When the pneumothorax is "open," that is the wound in the chest wall permits air to enter and leave the pleural space during respiration, a "sucking" sound may be heard. On the other hand, the wound can act as a one-way valve; air entering the pleural space when the victim inhales cannot escape when the victim exhales.

TENSION PNEUMOTHORAX

As air builds in the cavity, it collapses the injured lung causing a displacement of the mediastinum to the opposite side and compresses the uninjured lung. This is called a **tension pneumothorax**. See Figure 12. When this occurs, breathing will be greatly impaired and the lips and fingernails may appear blue.

HEMOTHORAX

In a chest injury there is usually bleeding into the pleural cavity producing what is called a **hemothorax**; this may be indicated by the

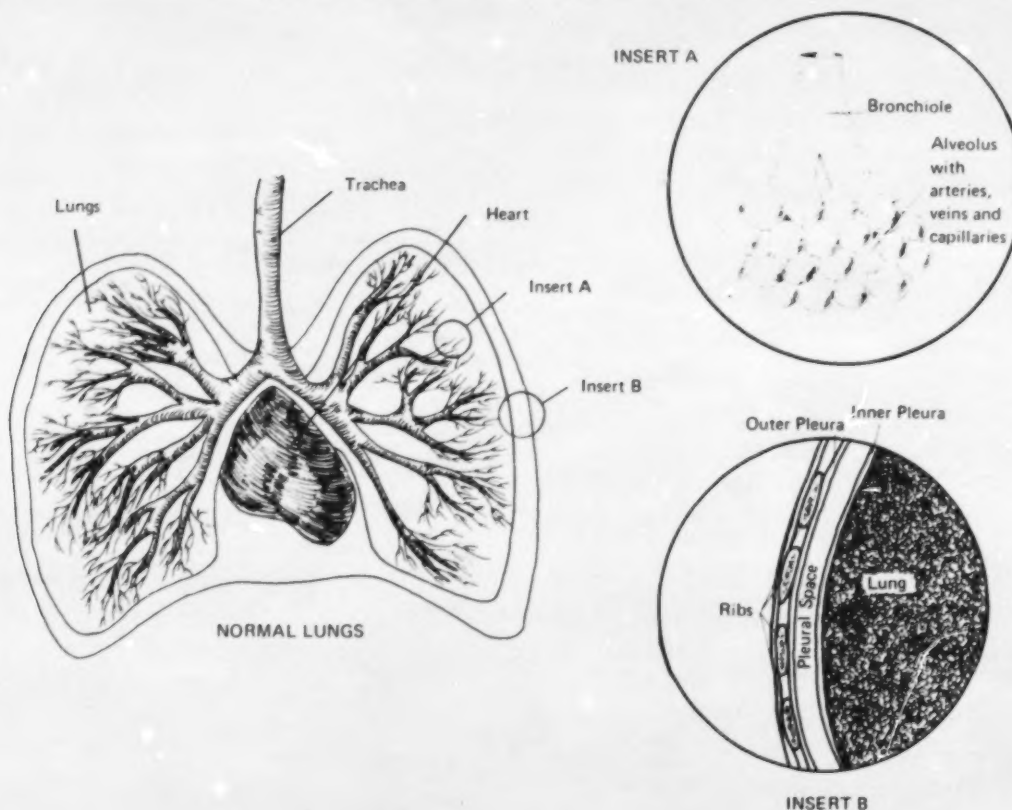


Figure 10. This close-up illustration shows the "inner pleura" covering the lung, and the "outer pleura" lining the thoracic cavity, thus creating a space between the two called the pleural space.

victim coughing up frothy blood. It will frequently accompany a pneumothorax, and when the bleeding in the chest cavity is severe, the victim may show signs of shock from the blood loss alone. A hemothorax will affect the victim much the same as a pneumothorax as it fills the chest cavity with something (blood) other than the lung.

SPONTANEOUS PNEUMOTHORAX

When a weak area in the surface of the lung ruptures, due to no injury, it is referred to as a **spontaneous pneumothorax**. It will allow air to enter the chest cavity the same as any pneumothorax with injury. The victim usually has a sudden, sharp pain in the chest and difficulty in breathing.

Injuries causing fractures may range from one rib to a stove-in or flail chest. Fracture of a single rib is generally indicated by sharp pain caused by breathing and resulting from grating of the bone fragments and partly from the aggravated tissue of the lung sac at the injury site. With severe multiple fractures, the portion of the chest wall that is uninjured will not move in unison with the rest of the rib cage. With very severe compression of the chest, stove-in or flail chest, the term **traumatic asphyxia** is often used because of the pressure produced on the heart.

FLAIL CHEST

When two or more ribs are fractured, each in two places, the segment between the fractures

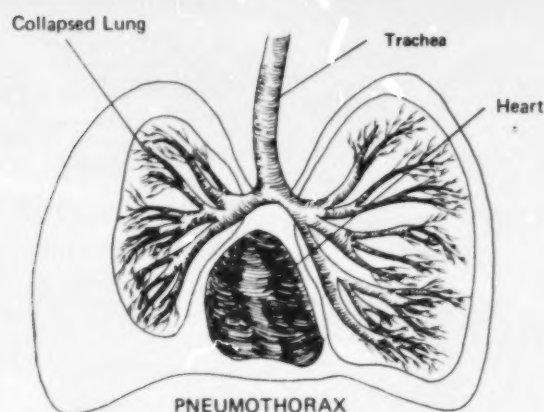


Figure 11. Pneumothorax (serious condition).
Air in the pleural space, and the lung is collapsed.

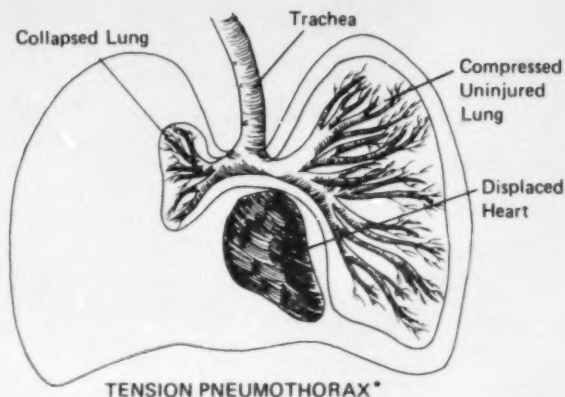
collapses and will not move normally with the rise and fall of the chest. When the victim inhales, the fractured segment will appear to be depressed. When the victim exhales, the fractured segment will protrude. This is known as paradoxical motion.

SIGNS AND SYMPTOMS OF CHEST INJURIES

Symptoms of chest injuries will depend upon the severity of the injury. The following are signs and symptoms normally found with most chest injuries. The victim will have pain due to fractured ribs or an outside wound; sometimes irritation of the pleura may cause a mild burning pain, shortness of breath, coughing up blood, and or cyanosis (bluish skin and nails). The victim will normally exhibit all signs of shock. If the victim is suffering from a tension pneumothorax the trachea may be shifted to one side.

EMERGENCY CARE OF CHEST INJURIES

A "sucking" chest wound should be suspected of all "open" chest injuries. The opening must be sealed off with some type of nonporous dressing. Aluminum foil, plastic or any similar



* The injured lung has collapsed to a point that the uninjured lung is being compressed and the mediastinum is being displaced to the opposite side.

Figure 12. Tension Pneumothorax (very serious condition). Air builds up usually under pressure in the pleural space then displaces the heart to the opposite side and compresses the uninjured lung.

material should be used. Make sure the opening is well sealed by overlapping 3" wide strips of tape. See Figure 13. The victim should then be placed on the injured side with head and chest slightly elevated. This will allow the uninjured lung to expand more freely and keep the victim's airway open and free of blood, vomitus and other aspirated matter. If the victim has an

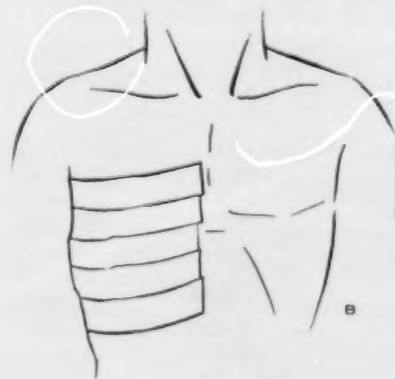


Figure 13. Application of airtight pressure bandage.

object protruding from the chest, place victim in a sitting or semi-sitting position. **DO NOT REMOVE PROTRUDING OBJECTS.**

Reassure the victim, support with oxygen and transport to a medical facility.

The treatment for a spontaneous pneumothorax is the same as a sucking chest wound, except the EMT will not have an outside wound to treat.

If during transport the victim's condition worsens, it is usually due to air buildup in the chest cavity (at times the trachea will be shifted toward the uninjured side). This is referred to as a **pressure or tension pneumothorax**. If a tension pneumothorax is suspected, and the original pneumothorax was caused by an open wound to the outside, the EMT should remove one side of the dressing to allow the air to escape. The moment the escaping air ceases, reseal the open wound. Watch the victim continuously. It may be necessary to repeat this procedure.

To stabilize a flail or stove-in chest, the EMT may apply a firm dressing over the injured

section of the chest. Sometimes the placing of a small pillow or similar object may prevent mobility.

Support the victim with oxygen and observe. If the victim should stop breathing, resuscitate immediately.

SUMMARY FOR TREATING CHEST INJURIES

After establishing an open airway, the first step in the care of a chest injury is to determine whether it is a penetrating wound. If it is a "sucking" chest wound, immediately apply an airtight seal and bandage over the wound. The following steps should include maintaining an open airway, controlling bleeding, treating for shock, and positioning victim on injured side if possible. Administer oxygen to increase the effectiveness of the lungs or portions of lungs that are functioning.

If the wound is not penetrating, **carefully** examine the injured area for rib fractures, flail chest, etc., and treat accordingly. Watch for possible complications.

ABDOMINAL INJURIES

Abdominal injuries must be considered serious because of impending death that could result from bleeding, shock, and infection. If the major trunk arteries are involved, fatal bleeding may occur unless the victim is immediately transported to a medical facility.

The abdominal cavity is divided into four quadrants and the midline area, each containing important organs which may be injured.

Injuries to the solid organs, such as the kidney, liver, and pancreas, produce serious internal bleeding plus inflammation due to leakage of urine, bile, and pancreatic juice. Injuries of the hollow organs, such as the stomach and intestines, produce a delayed inflammation, and the acid gastric juice causes irritation and often pain.

Abdominal injuries fall into broad categories including **penetrating** such as caused by bullets, ice picks and knives; and **non-penetrating** as from collisions with objects such as furniture, blows from fists, blasts from explosives, and crushing accidents.

SIGNS AND SYMPTOMS

The signs and symptoms of a penetrating injury are usually self-evident. High velocity bullets often have a small point of entry, but the wound caused at the exit point is usually quite large due to the explosive effect inside the body. Small pieces of steel, glass or stone, however, may be hurled with great force as by power lawn mowers and leave scarcely an identifiable wound of entry. Also, the object may enter the body outside the abdominal area but

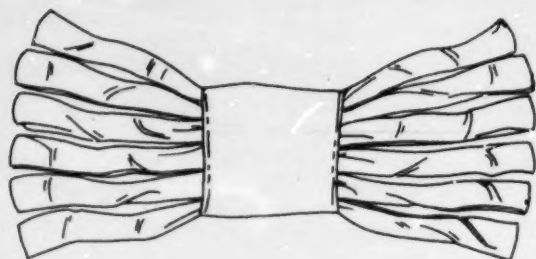


Figure 14. The scultetus binder or many tailed binder can be used for several kinds of emergencies

lodge inside the abdomen. Pain is usually severe and may be accompanied by nausea and vomiting.

In non-penetrating wounds, an injury to the internal organs may not be suspected because of other symptoms produced by additional injuries. For example, severe pain caused by fractures of the ribs may mask symptoms indicating an injury to the liver or spleen. Nausea and vomiting should alert the EMT to the possibility of abdominal injuries especially if the vomited matter contains blood. Pain and abdominal tenderness to hand pressure and rigidity of overlying muscles is an indication of the location of the organs involved.

Shock (pallor; cold, clammy skin; rapid, thready pulse; low blood pressure) generally accompanies abdominal injuries.

EMERGENCY CARE

In the treatment of abdominal injuries the EMT will cover all open wounds with a sterile dressing over which is placed a compression binder. This binder should be a scultetus or many tailed binder. See Figure 14. The scultetus binder consists of a square of heavy muslin or flannel material about 12 inches square to which a series of straps, of the same material, two inches wide and 18 inches long, have been sewn on two opposite ends. The square is placed on the victim's back, and the straps are then alternately brought around the victim's abdomen.

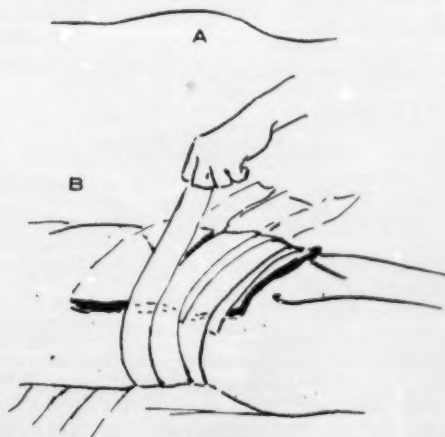


Figure 15. Abdominal wound with protrusion of intestine. A—Shows application of sterile, moist dressing; B—Application of scultetus (many tailed) binder.

The straps are pulled snugly, each strap overlapping the previous one to hold it and the dressing in place. See Figure 15.

If organs or bowels protrude, make no attempt to replace them. Cover them with a large, sterile dressing moistened with sterile water. After covering, apply the scultetus binder; but not so tightly as to interfere with circulation. Give nothing by mouth—no food or fluids. The victim will be most comfortable with the **knees flexed** and in a **semi-sitting position**. If the victim vomits, make every effort to prevent aspiration of the vomitus.

In summary, the care of abdominal injuries consists of:

1. Suspecting an abdominal injury.
2. Maintaining an open airway and supporting with oxygen.
3. Caring for any protruding organs.
4. Applying a moist dressing and a scultetus binder.
5. Positioning in supine position with knees flexed and head and chest slightly elevated or semi-sitting with knees flexed.
6. Transporting victim to a medical facility with a high degree of priority.

GENITALIA INJURIES

Direct injury to the genitalia may result from falls, direct blows, and explosions. Inserted objects and zippers are common causes of genitalia injuries of children.

SYMPTOMS

Depending on the severity of the injury, symptoms may be shock, intense pain (the victim may be in agony) and/or bleeding.

EMERGENCY CARE

The care of genitalia injuries is the same as that of other soft tissue injuries. Do not remove penetrating or inserted objects. Control bleeding with a sterile pressure dressing, treat for shock, and transport victim supine.

Caution should be used for zipper injuries; it may be best to make no attempt to open the zipper. If this is the case, however, the victim is in severe pain and cutting the clothing around the zipper may be helpful.

BURNS AND ENVIRONMENTAL INJURIES

OBJECTIVES

Upon completion of the following chapter, you will be able to:

- describe signs, symptoms and emergency care for burns, cold injuries, hypothermia and emergencies due to heat.

Following instruction and/or practice you will be able to:

- perform emergency care for burns, cold injuries, hypothermia and emergencies due to heat.

INTRODUCTION

Burns and other environmental injuries create pain, suffering and death for thousands of people each year. It is the obligation of each EMT to know how to reduce this pain and suffering so victims of these accidents have a better chance for a normal life without the dreaded fear of scarred tissue and/or amputated limbs.

CLASSIFICATION OF BURNS

Burns are classified as to the cause of the burn, the extent of the burned surface, the depth of the burn, the location of the burn, and the age of the victim.

CAUSE OF BURNS

Burns are generally caused by heat, chemicals, electricity, and radiation.

Heat may be moist such as from steam or boiling water, or dry such as fire, hot metal, or other hot objects.

Chemicals such as acids and alkalies can cause serious burns.

Electricity causes burns not only at the point of contact or entry to the body, but also at the point of exit. In addition to the burn injury, serious conditions may result from paralysis of the breathing control center or a convulsive action of the heart referred to as ventricular fibrillation.

Radiation burns include ultraviolet rays, x-rays and radium. Sunburn and burns from ul-

traviolet lamps usually are superficial and produce short-lived effects.

Regardless of the cause, if burns are extensive, shock will be present.

EXTENT OF BURNS

To determine the extent of the burned surface in children and adults, the "Rule of Nines" is used. (See Figure 1.) All emergency medical personnel should memorize the indicated percentages. They can then estimate the extent of the burn and transmit this information to the hospital. This figure will aid in determining the correct treatment for the burned victim.

Because a child is still in a continuous state of growth and development, the body surface areas are not proportional to those of an adult. Therefore calculation of the extent of a burn is different.

When the hospital or burn unit is notified of the transport of a burn victim, it should be informed of the percentage of burn, the degree

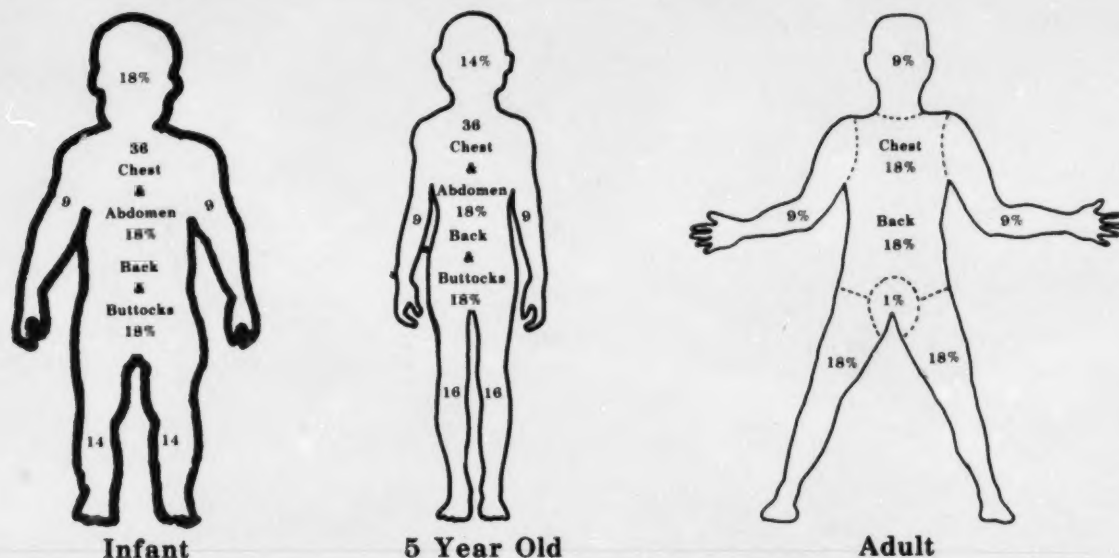


Figure 1. Body burns expressed in percentage of total skin surface.

of burn, the areas involved and the cause of the burn. This will help the staff prepare for the patient.

DEPTH OF BURNS

The depth of burns is spoken of in degrees. See Figure 2.

First Degree burns are the mildest, involving the outer layer of the skin (epidermis) and producing redness, increased warmth, tenderness, and mild pain.

Second Degree burns extend through the outer skin (epidermis) and involve the under layer of skin (dermis). Second degree burns produce blisters and are characterized by severe pain.

Third Degree burns are full thickness, destroying both the epidermis and dermis. Pain is usually absent because nerve endings have been destroyed. Color may range from white and lifeless as from scalds and steam, to black and charred as from oil or gasoline fires.

LOCATION OF BURNS

Burns of the respiratory tract are very serious and may be suspected from burns about the mouth, by coughing, spitting up of blood and carbon particles, and/or difficult breathing due to the swelling of the larynx. The swelling of the larynx is a serious condition requiring immediate transport by personnel at an adequate medical facility. An emergency tracheostomy must be performed in many cases.

Burns complicated by fractures or soft tissue damage must be considered critical.

AGE OF VICTIM

The age and health of a burn victim play an important part toward ultimate recovery. The very young and the very old may suffer burns of the same degree and extent as a 25-year-old person and not survive, whereas the victim in the mid-twenties will show a remarkable recovery.

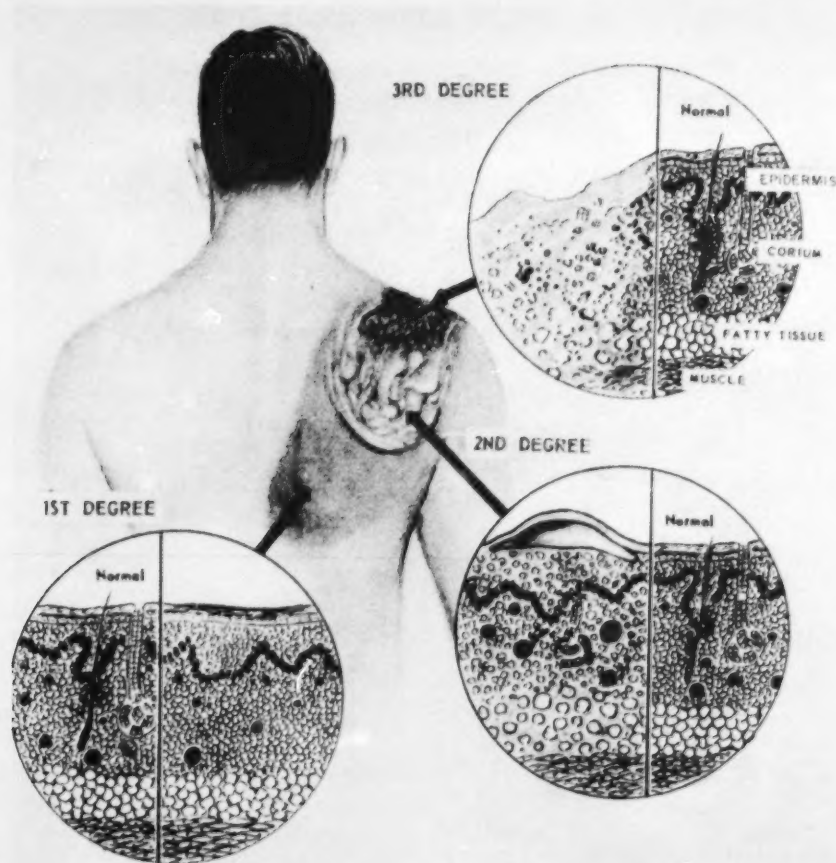


Figure 2. Degrees and types of burns

EVALUATION OF BURNS

MINOR BURNS

Second degree burns of less than 15% or third degree burns of less than 2% are classified as minor burns.

MODERATE BURNS

Second degree burns of 10% to 30%, and third degree burns of less than 10% are considered moderate if the hands, face, and feet are not involved.

CRITICAL BURNS

Second degree burns of 30% or more, third degree burns of 10% or more, burns that have involved the respiratory tract, and those burns that have been complicated by fractures and other soft tissue damage must be considered critical. **Third degree burns involving the face, hands, and feet are always critical.**

EMERGENCY CARE OF BURNS

The existing controversy as to the use of wet dressings or dry dressings is only shadowed by the many existing burn treatments in use in hospitals and clinics throughout the country. Due to this lack of uniformity and upon advisement of medical advisors, the following procedures are suggested.

EMERGENCY CARE OF BURNS MUST BE IN ACCORD WITH THE LOCAL MEDICAL AND HOSPITAL PROCEDURES.

If in doubt or lacking medical direction, apply only dry sterile dressings and burn sheets. When transporting the severe burn victim, it is rec-



Figure 3. The EMTs on this call are confronted with a burn of all three degrees which involves the entire left side of the back. The outside wrapper having been opened, the burn sheet is very carefully unfolded. Notice that the EMT is touching only the very corners of the sheet. This will make for a sterile area covering the burns. The sheet is handled in the same manner as when removing a sterile compress from its wrapper.

ommended you DO NOT use the vehicle's air conditioner. Upon arrival at the hospital, the physician can institute preferred treatment.

The immediate care for burns must involve the following.

1. Relieve pain.
2. Prevent or treat shock.
3. Prevent infection and further contamination.

The application of thick dressings will shut out the air and ease the pain. Dressings should be applied snugly but not so tightly as to interfere with circulation.



Figure 4. With the utmost care, cover the burn area and wrap the rest of the sheet around the victim. Do not use ointments or sprays of any kind on second degree or third degree burns. Treat victim for shock.



Figure 5. EMT is dressing a burn to the hand and fingers. Note sterile dressings between fingers.

Shock will be present in one degree or another and must be treated.

To prevent infection and further contamination of the burned surface, use only sterile dressings and burn sheets. See Figures 3 and 4.

When treating burns of the hands, feet, ears, under the arms, between the legs, or any place on the body where the victim's skin will come in contact with another skin surface, be sure a sterile dressing is placed between these surfaces. See Figure 5.

COLD WATER TREATMENT

For burns involving the extremities, immersion in cold water or the use of cold moist

towels has proved to be a most effective method of immediate care. This treatment, to be effective, must be continued until no pain is felt when the burned area is removed from the water. The time involved ranges from 25 minutes up to several hours. When the limb is finally removed from the water, it must be dressed with sterile material.

It is realized that clean water and ice are not always available but, when practical, this method provides relief of pain and a decrease in the amount of tissue damage.

COLD INJURIES

Although there are many ways in which cold can injure, most tissue damage results from circulation impairment brought about by exposure to severe cold or prolonged cold. The extent of tissue and circulatory damage is directly related to intensity of cold, duration of exposure and such other factors as wind (see

Figure 6), wetness, clothing, and other existing injuries.

Cold injuries can be classified as chilblains, immersion foot, trench foot, frostbite or freezing. See Figure 7. These classifications, however, only describe the mode of injury. Basically, there

CHILL FACTOR											
Wind in m.p.h.	Local Temperature in Degrees Fahrenheit										
	32	23	14	5	-4	-13	-22	-31	-40	-49	-58
Equivalent Temperature (Wind Plus Local Temperature)											
Calm	32	23	14	5	-4	-13	-22	-31	-40	-49	-58
5	29	20	10	1	-9	-18	-28	-37	-47	-56	-65
10	18	7	-4	-15	-26	-37	-48	-59	-70	-81	-92
15	13	-1	-13	-25	-37	-49	-61	-73	-88	-97	-109
20	7	-6	-19	-32	-44	-57	-70	-83	-98	-109	-121
25	3	-10	-24	-37	-50	-64	-77	-90	-104	-117	-130
30	1	-13	-27	-41	-54	-68	-82	-97	-109	-123	-137
35	-1	-15	-29	-43	-57	-71	-85	-99	-113	-127	-142
40	-3	-17	-31	-45	-59	-74	-87	-102	-116	-131	-145
45	-3	-18	-32	-46	-61	-75	-89	-104	-118	-132	-147
50	-4	-18	-33	-47	-62	-76	-91	-105	-120	-134	-148
little danger for those properly clothed considerable danger extreme danger											

Figure 6. The chill factor - temperature plus wind

Classification of injury	Time and temperature factors*	Symptoms
1st degree: Chilblains..... Pernio	Repeated exposure, several hours at a time, to temperatures between 32°** to 60°; generally associated with high humidity.	Redness and swelling; itching, burning dermatitis; tingling, and later deep-seated ache.
2d degree: Immersion foot....	Exposure to cold water (50° and below) 12 hours or more; or, to water of approximately 70° for several days. Immobilization, dependency.	Swelling legs and feet, cyanosis, numbness, tingling, itching, blisters, pain, neuromuscular changes.
Trenchfoot.....	Exposure to cold (32° to 50°), damp weather several hours to 14 days (average 3 days). Dependency, immobilization, constrictive clothing.	Part blanches, tingles, then becomes numb. Swelling legs and feet; cyanosis; blisters; intense burning pain; neuromuscular changes.
3d degree: Frostbite.....	Generally, brief exposure to extreme cold (-20° and below), or exposure to approximately zero weather for several hours.	First burning, stinging, then numbness. Ice crystals in skin cause gray or white waxy color. Skin will move over bony prominences. Edema; blebs; aching pain requiring medication; limitation of motion. Later gangrene, loss of tissue.
4th degree: Freezing.....	Exposure to -20° to -60° and below. May happen rapidly to exposed fingers and toes with extension as exposure is prolonged.	Ice crystals in entire thickness of part including bone, indicated by pallid, yellow, waxy color. Skin will not move over bony prominences. Edema; large blebs; intense pain; loss of motion. Later gangrene, loss of part.

Figure 7. Classifications and symptoms of cold injuries

are two types of cold injuries: freezing and non-freezing.

SIGNS AND SYMPTOMS

The involved area of a cold injury may present several degrees of injury without regard to a regular pattern of progression. Figure 7 shows the times and temperatures involved in producing cold injuries and the symptoms which each level or type of injury can be expected to present.

EMERGENCY CARE

Cold injuries should never be treated lightly because tissue loss and nerve damage are frequently involved.

If frostbite or freezing has occurred, the extremity should be soaked in a water bath of 104° to 108° Fahrenheit. The affected parts must not be rubbed or massaged; this damages and destroys the tissue.

As thawing occurs, the victim may experience intense pain. Treat for shock and transport to a medical facility. Avoid exposing the affected parts to freezing cold, weight bearing, or other activity that might result in further injury.

ABNORMAL LOWERING OF BODY TEMPERATURE

SIGNS AND SYMPTOMS

BODY TEMPERATURE

The most useful measure in identifying hypothermia, determining the need for treatment and evaluating the victim's chance of survival

is body temperature. The hypothermia victim has a core (internal body) temperature of less than 96.8° F. It must be emphasized that only core temperatures are relevant. This means oral temperatures cannot be used and rectal temperatures must be obtained. If this is not practical,

tical, the core temperature may be estimated by using the chart in Figure 8. Hypothermia is most often a cold weather condition; however, it may occur in other instances, such as with scuba divers, in all weather conditions.

BLOOD PRESSURE AND PULSE

With the hypothermia victim, blood pressure is lower than normal. It is frequently less than 100mm mercury systolic. The pulse is generally slow and often irregular. It may be difficult to locate a pulse in the extremities because of blood vessel constriction. In this case, the best location for measuring the heart rate is the carotid artery located in the neck or in the femoral artery located in the groin. In infants or small children, the best location to do this is the brachial artery.

LEVEL OF CONSCIOUSNESS

Individuals suffering from hypothermia often have alterations in their levels of consciousness. As the core temperature decreases to 90° F, the consciousness becomes progressively more clouded. Loss of consciousness occurs between 86° and 90° F.

RESPIRATORY RATE

Respiration is initially increased in the early stages of hypothermia. As the core temperature falls below 92° F, however, the respiratory rate

gradually diminishes. At low core temperatures, respiration is very slow and often labored.

SHIVERING

Shivering is a reflex mechanism used by the body to produce heat. It becomes increasingly vigorous and uncontrollable near core temperatures of 95° F, but steadily diminishes between 90° and 95° F. Shivering is replaced by muscular rigidity between 86° and 90° F.

GENERAL APPEARANCE

The hypothermia victim is pale in appearance and the skin is very cold to the touch. The victim's pupils begin to dilate at core temperatures near 92° and are fully dilated and poorly reactive to light around 86° F.

TREATMENT OF HYPOTHERMIA

Emergency treatment should begin as soon as possible. Remember, the body temperature continues to fall even though the victim is no longer exposed to the cold water or air.

OBSERVE RESPIRATION CLOSELY AND REMOVE ANY SECRETIONS

If a suction unit is available, a catheter suction of the trachea is advisable if breathing is impaired. If oxygen is not available, mouth-to-

ESTIMATING CORE TEMPERATURES

(1) above 95 degrees F:	The victim is conscious, alert and may have vigorous shivering.
(2) 90—95 degrees F:	The victim is conscious, but he has a mild to moderate clouding of his mental facilities. Shivering is present, but diminished.
(3) 86—90 degrees F:	The victim has severe clouding of his consciousness, or he may be unconscious. Shivering is replaced by muscular rigidity.
(4) below 86 degrees F:	The victim is unconscious, with diminishing respirations.
(5) below 80 degrees F:	The victim has barely detectable or non-detectable respiration.

Figure 8.

mouth resuscitation may be necessary. This should be done at a reduced rate, however, because the hypothermia victim has a decreased metabolic rate.

GIVE NOTHING ORALLY

Watch for vomiting and the possibility of aspiration (taking into the lungs) of vomitus. Under no circumstances should alcohol be administered to a victim of hypothermia.

TREAT FOR SHOCK

A victim who has been hypothermic for long periods may experience a dangerous fall in blood

pressure during rewarming. Consequently this patient should be kept lying backside down with legs slightly elevated and the head slightly lowered. Further long-term treatment of this victim can only be accomplished in a medical facility. It is imperative the hypothermia victim be transported to a medical facility as soon as possible.

EMERGENCIES DUE TO HEAT

When individuals exert themselves in a hot environment, a considerable portion of the circulating blood must be directed to the vessels of the skin in order to radiate heat from the skin surface and to support the action of the sweat glands.

When the nerves which control the expansion and contraction of the blood vessels (vasomotor control) and the heart are unable to meet the needs of increased circulation to the skin, muscles, and brain, the individual will collapse. The usual heat emergencies are heat exhaustion, heat cramps, and the most serious, heatstroke.

HEAT CRAMPS

CAUSE

Heat cramps is a condition affecting certain individuals who do heavy work in hot places or during extreme summer heat. These cramps are often an early sign of approaching heat exhaustion. Heat cramps occur as a result of an individual not replacing the water in the body lost through sweating.

SIGNS AND SYMPTOMS

With profused sweating, electrolytes are lost from the body causing initially slight muscle twitching in the abdomen and extremities. This progresses to violent, painful muscle cramps.

The victim does not usually lose consciousness but will complain of severe pain. Some symptoms of heat exhaustion may accompany the cramps, and breathing may be somewhat impaired if the respiratory muscles are involved. The condition, being very painful, is seldom considered dangerous.

EMERGENCY CARE

Manual pressure and massage may give some relief to the cramped muscles. As is often the case, the best treatment is prevention. Prevention may include drinking plenty of electrolyte-enriched fluids such as Gatorade.

HEAT EXHAUSTION

CAUSE

Heat exhaustion is caused by exposure to heat. It may occur outdoors in a hot, humid atmosphere but most often in such places as laundries, bakeries, and foundries. It usually follows overeating plus overdrinking of iced liquids. Heat exhaustion must not be mistaken for heatstroke.

SIGNS AND SYMPTOMS

Heat exhaustion usually begins with dizziness, weakness, nausea, and vomiting. The victim has a feeling of exhaustion and experiences difficulty in walking. The pupils will be dilated; the

pulse fast and weak; breathing will be rapid but shallow; and the skin will be pale, cool, moist, and clammy. Sweating will be excessive over the entire body, and the victim may lapse into unconsciousness.

EMERGENCY CARE

Place the victim in a reclining position in a cool environment. The victim who has fainted will usually gain consciousness in a short time. The victim should be kept at rest and given large amounts of water to drink or a glucose-enriched drink such as Gatorade.

HEATSTROKE (SUNSTROKE)

CAUSE

Heatstroke can be recognized by the extreme elevation of body temperature due to the failure of the body sweating mechanism or the overall body temperature regulating mechanisms. This is a most complex system that regulates the body's temperature whether an individual lives at the North Pole or the equator. It can be caused by prolonged exposure to the direct rays of the sun, exposure to excessive indoor heat, too much clothing in a hot environment, or possibly alcoholism.

SIGNS AND SYMPTOMS

The victim may occasionally be aware of the absence of sweating, but often the first indication is a sensation of extreme heat. Weakness, headache, dizziness, mental confusion, delirium, and unconsciousness are progressive symptoms. The victim's skin will appear flushed, hot and dry. In the early stages the pupils are constricted and later, as the condition progresses, they will dilate. The pulse rate may be 160 or more.

Breathing will be rapid and usually of the snoring type. The victim's temperature may rise rapidly to 105° or higher. Convulsions, vomiting, shock and circulatory failure may follow, leading to death.

EMERGENCY CARE

The care of the heatstroke victim calls for immediate action to quickly reduce the body temperature to prevent brain damage and death.

Remove the victim to a cool environment if possible. Immediately apply measures to reduce the body temperature; brain damage is the product of time as well as temperature.

Apply cold cloths or an ice pack to the head. The body must be wrapped in cold, water-soaked cloths. Continue to pour cold water on the cloths during transport and gently massage the victim to assist the circulation of the cooled blood to the brain. If the victim is unconscious, maintain an open air passage and transport to a medical facility as soon as possible.

	HEAT CRAMPS	HEAT EXHAUSTION (HEAT PROSTRATION)	HEAT HYPERPYREXIA (HEAT STROKE)
Skin	Pale-excessive perspiration	Pale, cool and clammy	Hot, dry-at first ruddy, later gray
Body Temperature	Normal or slightly elevated	Usually normal, may be sub-normal or slightly elevated	Rapidly increasing rise-up to 39 C. (102.2 F.)
Pulse	Rapid, strong	Rapid, weak	Rapid and full early; later weak & thready
Blood pressure	Normal	Decreased	Increased early; later decreased
Pupils	Normal	Dilated	Dilated
Body odor	Normal perspiration	Normal	Offensive
Muscle cramps	Severe	None	None
Convulsions	Generalized twitching	Rare	Epileptiform type-early in course
Nausea and vomiting	Mild nausea-vomiting rarely	May be prolonged	Usually does not occur
State of consciousness	Normal	Stupor-coma in severe cases	Early loss of consciousness
Pain	Severe (from muscle cramping)	Headaches in mild cases	Only at onset
Treatment	Rest in cool place. Correction of dehydration	Removal from excessive heat and humidity. Correction of dehydration. Supportive & symptomatic care.	<i>Immediate</i> reduction of body temperature. Control of convulsions. Cardiac and respiratory support
Hospitalization	Not necessary	Rarely necessary unless underlying cardiac or other pathology is present	Essential, with cooling measures during transportation
Prognosis	Complete recovery without residual ill effects	Good in absence of severe preexistent underlying pathology	Hopeless in untreated cases: poor (50% mortality) in treated cases. Surviving cases may have permanent mental damage.

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